MOT4Rivers:
Monitoring, modelling and mitigating pollution impacts in a changing world: science and tools for tomorrow's rivers

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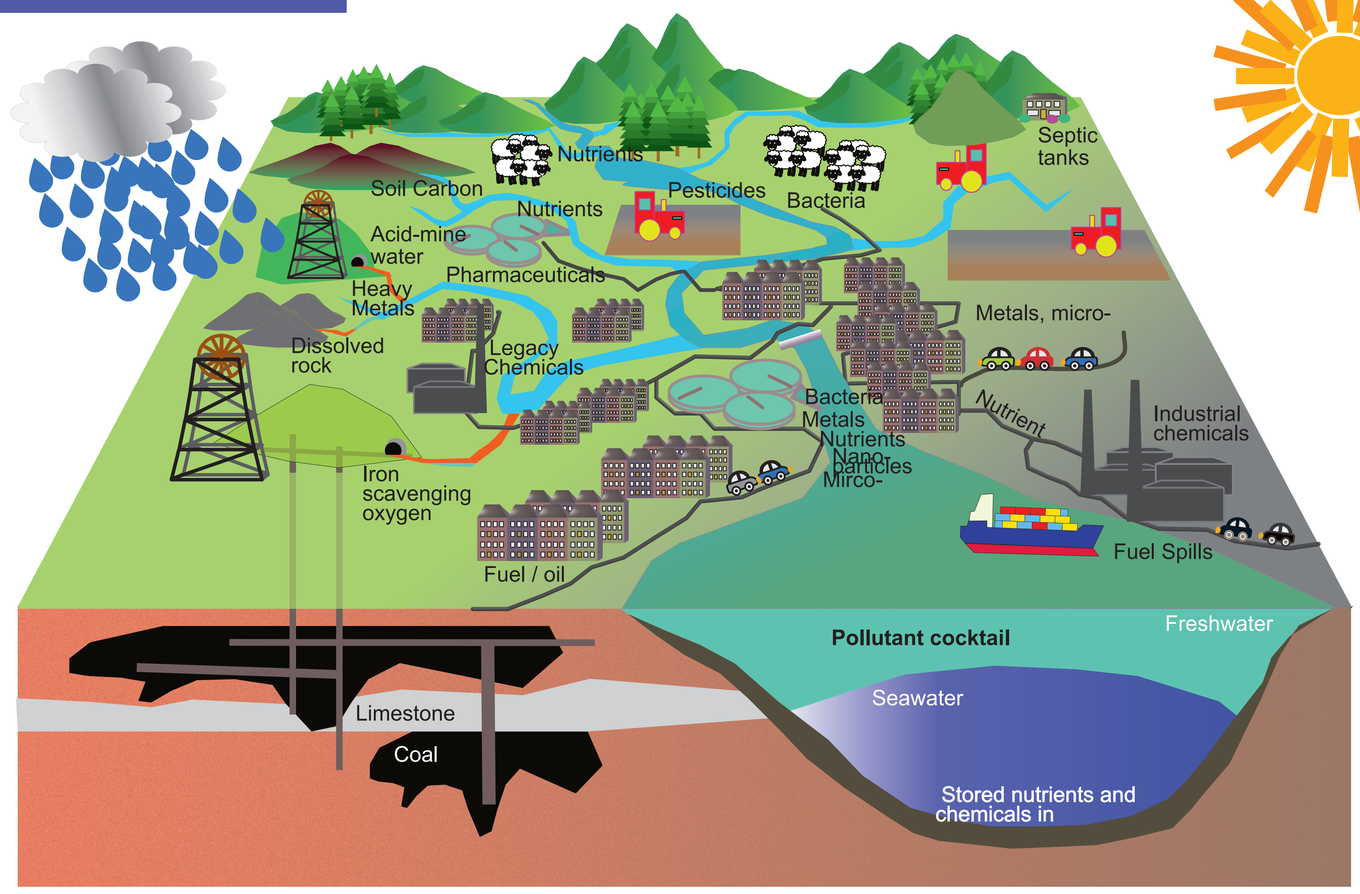
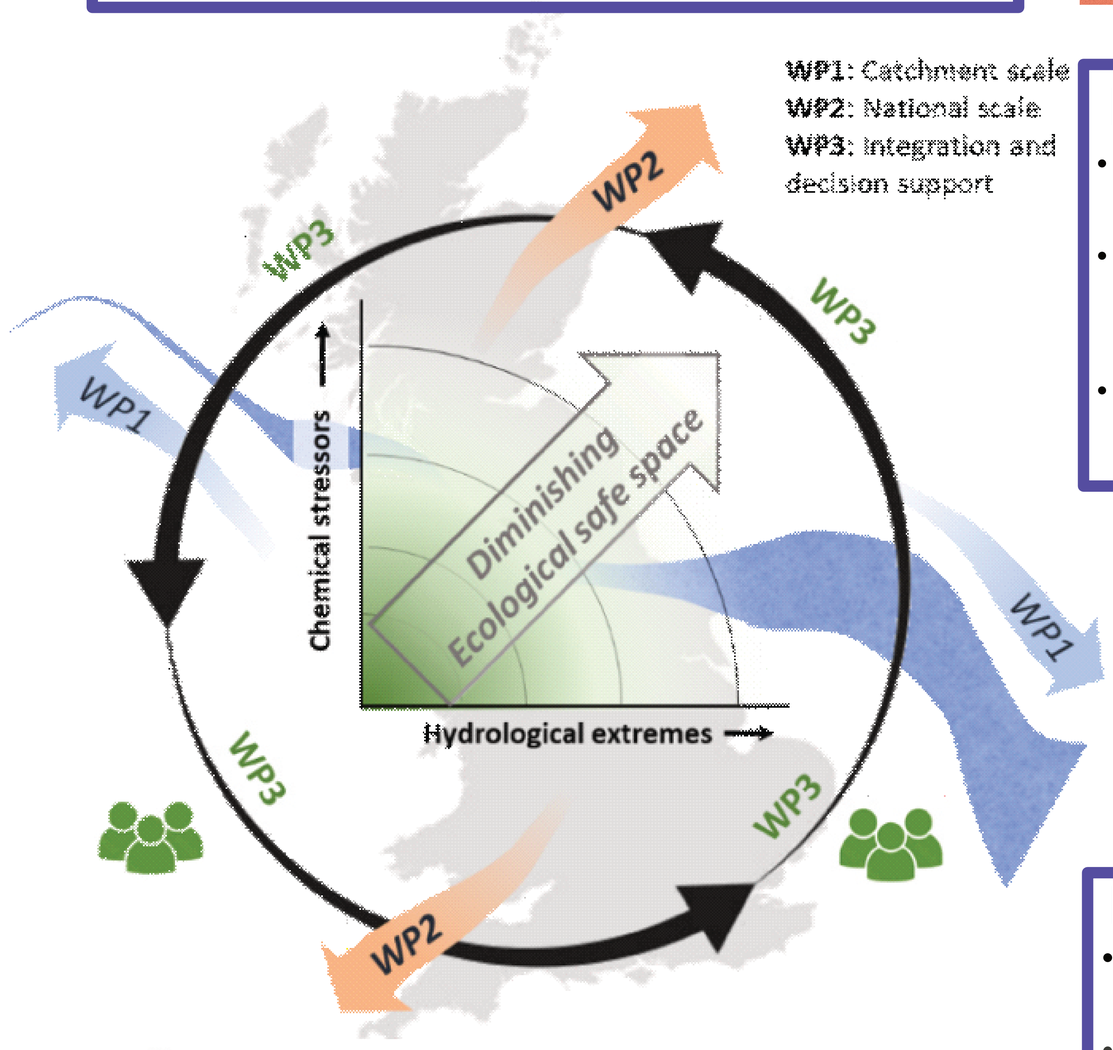
Background:

- For centuries, human activities have impacted our rivers by shifting the sources and combinations of pollutants
- While significant reductions in some regulated pollutants (industrial chemicals, nitrogen and phosphorus) have been achieved, we are still witnessing declining river water quality and the resulting loss of freshwater species
- There are now more complex emerging contaminants (e.g. pharmaceuticals, pesticides, organic chemicals, illicit drugs, micro plastics), challenging our freshwater species with a bewildering combination of pollutant cocktails
- Climate-change driven shifts in water quantity (larger floods, longer droughts, increased run-off and warming waters) stress freshwater ecology and enhance the potential toxicity
- Run-off together with our wastewater systems and combined sewer overflows transport these emerging pollutants from our cities and towns into our freshwater environment.





MOT4Rivers Research Objectives

- How do land and hydro-climatic interactions affect the movements of pollutant cocktails through the environment?
- Can spatio-temporal clusters of exposure to pollutants mixtures and and their interactions with hydro-climatological conditions explain variation in ecological community structure and function?
- Can we identify an ecological safe space, where ecosystems flourish at both catchment and national scales?

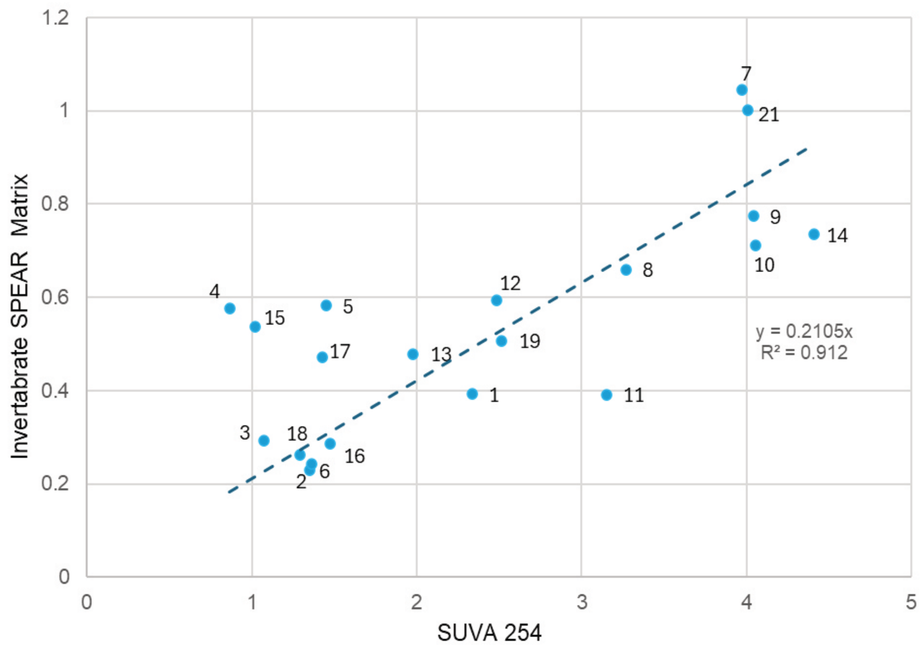
Wastewater overflow

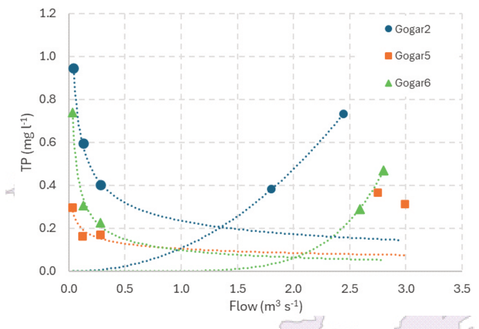
Acid mine water inflow

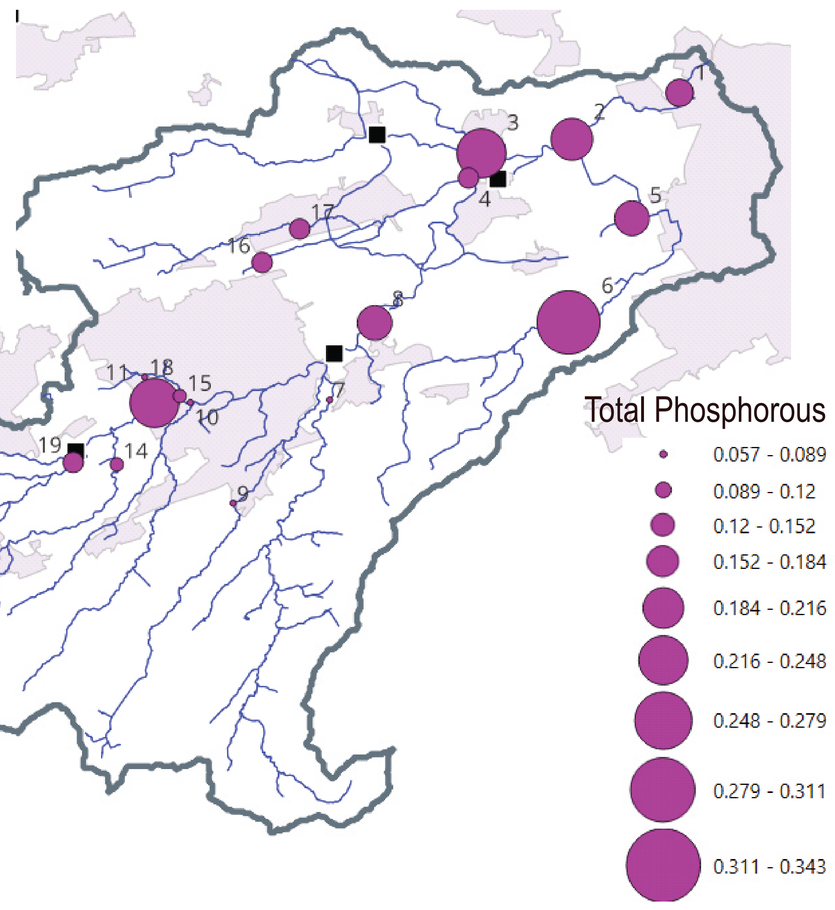
Scum and debris build-up

Initial Results

- Pollutants increase in concentration at both hydro-climatological extremes (drought and flood), dependent on location and pollutant.
- Strong correlation between SUVA-254 (a measure of anthropogenic impact on dissolved carbon) and invertebrate health (SPEAR). Low SUVA-254 derived from wastewater and agriculture and High SUVA-254 from peatlands.
- SUVA - 254 is a good predictor of impacted biodiversity.
- River Almond pharmaceutical pollution is some of the highest in Scotland







Actions needed

- Reduce hard surface run-off and hence wastewater plant overflow. Introduce more SUDS to store water within groundwater and reduce hydro-climatological extremes.
- Improve ibuprofen removal in wastewater treatment and stop septic tanks flowing directly to rivers.
- Prevents neonicotinoid pet parasite treatments being used as a preventative rather than treatment (close gap in law).